REVEGETATING A VERY SALTY SCALD IN THE NARANGARIE VALLEY – DUNEDOO 2

SUSTAINABLE GRAZING ON SALINE LANDS

Case study – Dunedoo 2

FARMER: STEVE FRANCIS, LEADVILLE, NEAR DUNEDOO, NSW

QUICK FACTS

Area of site: 4 ha

Watertable: at surface only in wet years

Soil type: red brown earths, light clay texture

Soil salinity (EC_e): 0.4–33 dS/m at 0–10 cm; 3–14 dS/m at 100 cm

Sodicity (ESP): up to 38% in places

Soil pH (water): 6.0–7.0 at surface

Pastures sown: mainly tall wheatgrass

The problem

The salinity issue dates back to the 1930s and has periodically been an issue ever since. The 1950s floods removed the topsoil. More salt then appeared, coinciding with clearing of some of the surrounding hills of trees. A culmination of these factors may have created the conditions for salt to come to the surface.

During the early 1990s the salinity problem seemed to increase and spread. The site is now about 4 ha of concentrated salinity. Steve has fenced off 12 ha around it and is managing it as a salinity block. He has planted trees around the paddock and has tried to establish good perennial pasture (lucerne and tall fescue) above the scald, but this seems to have had little effect on reducing the scald.

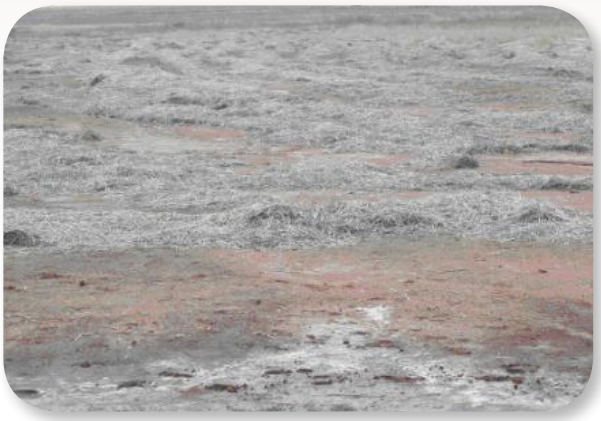
Salt-tolerant pastures have been sown previously on the scald, with some establishment on the fringe zones, but nothing would grow on the really salty areas.

Steve tried a small experiment on this site in 2002. He put down a thick layer of mulch over a small area on the scald. Three months later the salinity of the surface soil under the mulch was tested and compared with that of the bare scald next to the mulch. The unmulched area was nearly four times as salty as the mulched area. Bare soil evaporates a lot more water than mulched soil. Salt does not evaporate, so the surface becomes hypersaline over time, creating an environment very hostile to germinating seeds.

Therefore, for this trial Steve decided to mulch before sowing. He was hoping to establish salt-tolerant pasture species in these extremely salty conditions.

Luke Beange

Before: *The site in 2004, showing extensive scalding.*



Jenene Kidston

Mulch on the site in November 2004.

Actions taken at the site

A paddock of cereal stubble was baled in spring 2004, and the 240 round bales obtained were spread onto the saline site, mulching it like a garden, with the idea of keeping the topsoil moist and reducing the evaporative concentration of salt at the surface. The mulch was then left for 9 months, which included an extremely dry autumn and a locust plague.

A total of 7.3 t of gypsum was spread on top of the mulch in a concentrated area, giving the equivalent of about 2 t/ha.

Sowing took place in June 2005, coinciding with good rain. A pasture mix of puccinellia, tall wheatgrass, Palestine strawberry clover, Paradana balansa clover, Puna chicory and Tonic plantain were sown on the scald with Granulock™ 15 fertiliser. The sowing method was simply to run a combine over the area and drop the seed into the mulch.

Luke Beange

The site in October 2006, showing patchy success with pasture.

Jenene Kidston

***After:** Pasture successfully established through mulch in September 2006.*

Steve Francis

Pasture germinating through mulch one month after sowing.

In the surrounding areas, around the saline scald, the pasture mixture was Rhodes grass, Quantum tall fescue, Holdfast phalaris, Palestine strawberry clover, and Paradana balansa clovers, plus paspalum. This was sown by minimum tillage.

There was good rain after sowing, with good follow-up all through winter and spring. In July Steve was very pleased to observe pasture germinating all over the mulch, but commented 'Let's see what happens when they get into the salt though'. At the same time Steve sprayed for saffron thistles and mites.

Results

Eleven months after sowing (May 2006), the plants seemed to be growing quite well, despite the autumn drought. At that stage the pasture had been crash-grazed once, with a big mob (1000 sheep and 200 cattle for 2 weeks), when it had become rank, but only after good establishment and full seed set of the tall wheatgrass. The stock were taken out when the tall wheatgrass was about 30 cm high. Over the next year and a half small mobs of sheep and cattle were occasionally put in. Steve crash-grazes the area generally when the pasture gets rank, with the intention of keeping cover on the scald.

Drought again prevailed throughout 2006.

The mulch appeared to have broken down much faster than initially thought.

The pastures were measured by Jenene Kidston, Agronomist, Industry & Investment NSW, Mudgee, in the springs of 2005 and 2006. The readings for ground cover and pasture composition appear in the tables below, along with her comments:

Ground cover on scald (%)

Type	Spring 2005	Spring 2006
Bare ground	33	15
Living plants	58	54
Litter	9	31

In 2004 the site was largely bare ground. This improvement was pleasing, especially considering 2006 was very dry.

Pasture composition (%)

Type	Spring 2005	Spring 2006
Ryegrass	44	41
Tall wheatgrass	10	22
Clover	21	19
Remainder: – desirable – weeds	 7 18	 6 12

It was pleasing to see the proportion of tall wheatgrass increasing, as it seems to be the main hope for surviving in the long term. The improved establishment of more robust salt-tolerant species like tall wheatgrass is helping to outcompete weeds.

While long term persistence of perennials, water use and ground cover will be the true test of success, it appears that this method of remediation has been successful on an extremely saline discharge site which has been increasing in area over a long period. It also provides grazing, particularly in dry times.

Final comments from the landholder

The key is what will survive in the long term. I know I can get plants to establish into the mulch, but once the plants get their roots down into the salt, what happens then?

Persistence is the main thing. The test will be a wet season. The scald in the past has been made worse by wet seasons followed by a drought – hence the importance of keeping pasture cover on top of the ground.

We feel like we are heading in the right direction for recovery. There is nothing worse than driving past a scalded area. We feel like we are doing something beneficial. We feel like we have reined it in; it was definitely getting bigger. Next time we would not consider doing it without mulching.

We are not sure if contour banks are good. They were built for erosion control. They are good for flash floods but now we would like to keep it wet. The system has changed now with minimum tillage. There is better infiltration and less erosion and the soil is improving. *Steve Francis*

Prepared by Luke Beange, Advisory Officer, Industry & Investment NSW, Dubbo

Acknowledgments

Jenene Kidston, District Agronomist, Industry & Investment NSW, Mudgee, took the pasture measurements and provided interpretations, conclusions and photos.

NSW Salt Teams.

APPENDIX

Surface soil data (0–10 cm, late summer 2004)

Good patch[B]	Bad patch[B]	Bulk[A]
pH at surface ($CaCl_2$)		
5.0	6.9	6.8
Salinity, late summer (est. EC_e, dS/m)		
0.6	17.6	4.8
Organic carbon %		
1.2	1.8	1.3
Sulfate sulfur (KCl) mg/kg		
8.5	130	21
Phosphorus (Colwell) mg/kg		
42	76	54
CEC meq/100 g		
5.6	31.9	16.1
Ca/Mg ratio		
2.8	0.73	0.81
Sodicity, ESP %		
4	38	13

[A] *Samples used for measurements were taken from at least six holes (0–10 cm deep) made in locations with a range of salinity symptoms (visually assessed).*

[B] *Samples used for measurements were taken from one hole (0–10 cm deep) made in a location with no salinity symptoms and one in a location with extreme salinity symptoms (visually assessed).*

Notes:

CEC, cation exchange capacity

ESP, exchangeable sodium percentage

Salinity (dS/m): Slight 1.5–2; moderate 2–6; high 6–15; extreme > 15

Non-sodic, ESP > 6%; sodic 6%–14%; strongly sodic > 14%.

For further information, see the *Glove Box Guide to Salinity* (NSW DPI) for your part of NSW, on the page headed 'Soil testing for salinity and sodicity'.

Salt profile

Six holes were dug on the scald to a depth of 1 m. Hole locations were chosen to represent a range from the worst- to the best-looking salinity symptoms.

The readings showed that, even when surface salinity was low, salinity levels were quite high down the profile all over the site, indicating that the whole site was underlain by quite salty groundwater. This explains why, even when pastures germinate, they have difficulty persisting when their roots get farther down into the soil profile.

Approximate salinity (EC_e in dS/m) down the soil profile

Hole number	0–10 cm	50 cm	100 cm
1	0.4	2	3
2	3	7	5
3	5	5	5
4	2	11	7
5	33	10	14
6	27	14	12

Rainfall during trial (mm) (average annual rainfall = 633 mm at Mudgee)

	Jan	Feb	Mar	Apr	May	Jun
2004	24	91	26	14	51	34
2005	37	55	51	0	0	112
2006	86	61	10	36	1	30

	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	42	39	36	49	50	127	**582**
2005	38	18	98	69	96	30	**604**
2006	70	11	17	0	51	51	**423**